Nuestra Tierra Dinámica

- **Marina La Grave**, Project PI
- **Barry Kluger-Bell**, Program Developer &PD
- **Bob Russell**, External Evaluator
- **Mateo de Valenzuela**, Green Labs Coordinator
- **Kristine Johnson**, EdM, Educator Consultant

About the program

- The NTD program's goal is to "raise global climate change and Earth system literacy of its participants through inquiry-based, hands-on science investigations and engineering activities" in a fully bilingual and culturally supportive environment.
- We implemented the program at Columbine Elementary, a Tittle One school, a low-performing school with a predominance of both students who are English-language learners, and those who qualify for free lunch exhibits great need for just such a program as this.

Nuestra Tierra Dinámica was developed and directed by **CLACE (Latin American Center for Arts, Science and Education**.) **(OpEPA USA** served as fiscal agent.)

The project includes two principal components (and Professional Development):

1. **Green Labs**, grades K-5: In the Green Labs, students met weekly and participated in a variety of bilingual hands-on activities and journaling on basic science concepts underlying climate change science, organized around the themes of Air, Water, Soils and Energy.

2. **Video Labs**, grades 6-12: students conducted background research on climate change issues and produced 27 short video segments designed to educate students and family about climate change science and actions that can be taken to address climate change.

Green Labs

- The project was originally designed so that program activities would be developed and formatively evaluated tested for Year 1 in preparation for full implementation and summative evaluation in Year 2.
- The goal of developing a complete and evaluated curriculum fro Green Labs in Year 1 proved to be unrealistic, in part, because the project attempted to develop new activities on an ongoing basis while implementing the program.

Video Lab

- The goal of developing a complete and evaluated curriculum for **Video Labs** in Year 1 proved to be truly valuable. It allowed Video Lab students to master video technology and editing skills. They learned three different components of Video productions: Animations, PSA's and Commentaries.

- By year 2 students were able to focus on Climate Change research and topics of interest. The great quality of their work propelled CLACE's PI to pursue additional funding (NCAR Diversity grant) to be able to bring 15 HS students to AGU to present their work and enjoy San Francisco.

- The trust developed with families allowed for ALL students to travel although it was the first time (14 our of 15) ever boarded a plane, or had seen the ocean. The experience empowered ALL and 2 female students were offered a full time summer internship at NCAR!

Deliverables

Green Labs

- Grades K-2: A total of 18 Lesson Plans
- Grades 3-5: A total 22 Lesson Plans

Video Lab

- Grades 7-8: 4 Climate Change videos
- 9-12: 22 Climate Change Videos (PSA's. Commentaries and Animations)
- "**Culturally Responsive Teaching Training Techniques**" presentation/workshop
- **Facilitator's Manual**
- **Poster Presentation (AGU, CU STEM, CAEE, NSTA.)**
- Project PI presented NTD as **a Keynote Speaker for National Conferences at COSA (Colorado Open Space Alliance) and Green Schools.**

Below please see highlights of numbers reached through NTD

Students grades K-5 GL: 288

Students grades 6-8 VL : 11

Students grades 9-12 VL: 14

Videos developed grades 7-12: 30

Alaska Video Lab Students: 22

Families reached: 280

Family Nights: 23

Participating Schools: 6

Professional Development: 15

Translated NASA Resources: 103

Developed Lesson Plans : 65

Creating an Enduring Legacy of Climate Change Education for Underserved Students in Georgia

NASA Innovations in Climate Change Education (NICE)

Cherilynn A. Morrow, Original PI
(Physics & Astronomy Georgia State, now Aspen Global Change Institute)

Jeremy E. Diem, Co-I
(Geosciences, Georgia State)

Brett A. Criswell, Co-I
(College of Education, Georgia State, now College of Education, U. Kentucky)

W. Crawford Elliott, Successor PI
(Former Chair, Geosciences, Georgia State)

Key Collaborators
Judith Monsaas
John Katzenberger
Comfort Afolabi
August Ogletree
Ian Flitcroft

NASA NICE
Lessons Learned Teleconference
21 May 2014

PROJECT GOALS >> Success ≠ No Obstacles

Flex in Response to New Opportunities and a Changing Environment

- **GOAL 1: Renovate Labs for Introductory Undergraduate Weather & Climate Course [GEOG 1112]**

  Goal 1b: Create Opportunity for Early College students

  >> Blocked following challenges internal to APS

- **GOAL 2: Establish Teacher Certificate to Encourage MAT Candidates to Learn About Earth and Space Science**

  >> Blocked due to system-wide moratorium on certificates

  >> University Approval of GEOG 7112 for MAT students.

- **GOAL 3: Conduct Summer Educator Institute**

  ~~***>> Build Professional Learning Community***~~ (sister projects)

  >> 1.5 day Workshop for HS Teachers & Higher Ed Faculty

- **GOAL 4: Establish CO_2 Monitor for Downtown Atlanta**

  >> Create a Network of 3 Monitors in Atlanta Region

- **GOAL 5: Research, Evaluate, Disseminate**

  >> Develop a Concept Inventory on Climate Change (CICC)

C. Morrow - cmorrow@agci.org

WHY GEOG 1112 ?
Introduction to Weather & Climate

1) not intensely mathematical, science that is academically accessible for diversity of students, including Early College;

2) multi-disciplinary and relevant to real life;

3) 4-semester hour *lecture-lab* course (opportunity for inquiry activities);

4) very popular at GSU (>1000 students per year) - offered all year round so logistically accessible;

5) required for geography majors, appeals to non-majors, Maymester course appeals to MAT students;

6) taught at other colleges & universities in Georgia;

Sample GEOG 1112 Demographics

Fall 2013 Semester POST (N=436 over 6 sections)

- Freshmen or Sophomores: 69%

- STEM majors : 8 %
- Education or Communication majors: 10%

- Female: 57%
- Male: 41%

- 29% White;
- 51% Black;
- 11% Asian;
- 8% Hispanic

Geog 1112 Lab Topics

(1) Solar Radiation & Seasons**
(2) Stratospheric Ozone**
(3) The Troposphere**
(4) The Carbon Cycle**
(5) Global Surface Temperature*
(6) Glacial-Interglacial Cycles**
(7) Temperature Changes over the Past Millennium
(8) Climate & Water Availability
(9) Current Climate Variability and Change**
(10) Future Climate Change (not yet available)

** = reviewed through NASA's Product Review.

* = currently under review

Labs on-line at
sites.gsu.edu/geog1112

Others to be renovated and reviewed within the next year and included among the suite of labs to yield a total of ten interconnected labs guided by the principles and concepts of climate literacy.

Georgia State University and UGa-Griffin

Current carbon dioxide concentration (in ppm) in downtown Atlanta

404

Dr. Jeremy Diem, Co-I

Our project has established a 3-site CO_2 monitoring network for educational use:

1. on campus monitor in urban Atlanta
2. rural monitor to the north (John's Creek)
3. rural monitor to the south (UGA-Griffin)

The Concept Inventory on Climate Change

- Our project collaborated with Aspen Global Change Institute and the University System of Georgia to develop the Concept Inventory on Climate Change (CICC).
- The CICC is a 34-item, research-based, multiple-choice instrument that provides a valuable new assessment tool rooted in the *Climate Literacy Principles*. Invited talks presented at GSA and AGU.

Thanks to instructors Dunkley, Nogueira, and Diem for classroom time and access over several semesters

Concept Inventory for Climate Change

Potential as Tool for Change

In higher education (e.g. introductory physics), The Force Concept Inventory (FCI) has been used to provide curriculum developers, education researchers, and instructors with **valuable feedback on the effectiveness of teaching strategies** in overcoming common student misconceptions.

Properly used, a well-designed, validated Concept Inventory can play a vital role in **transforming teaching practices among faculty toward becoming more evidence-based** about whether students are actually learning.

LESSONS LEARNED
Interweaving CU and GSU

Air, Water, Soils, Energy

Project Planning

U. Colorado

- **Allow a period for planning and development before launching project implementation**. We launched the project by simultaneously developing curriculum and implementing the project, so we didn't allow adequate time for getting ready on Year 1.

- **Make sure external evaluator provides ongoing, formative feedback during project implementation.** During our first year, the external evaluator did not provide consistent, timely evaluation. We changed evaluators.

- **Plan a realistic scope of work.** Our goals during Year 1 were too ambitious. We achieved most of our goals, but we were stressed which prevented us from achieving a smooth method of operation until a few months into the project.

- **Focus and plan what you can do well.** During our first year, we planned too many family events and too many outside presentations. During our second year, we "streamlined" our project, reducing these events – and had a more focused impact.

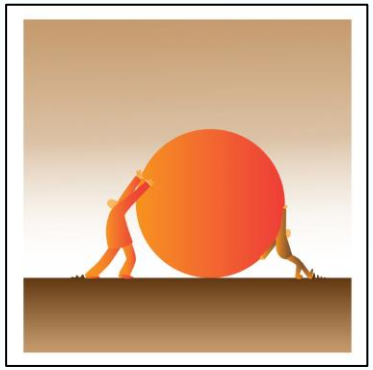
Project Planning

Georgia State

- **More up-front planning and development in Year 1**
- **Concur!** This was more important than we realized. Team members crossed departments, Colleges, and institutions. In retrospect we needed to devote more time and resources in Year 1 on **team-building** and cultivating **mutual appreciation for** one another's expertise and how it contributes to project goals.
- Suggest possibilities of external facilitation and/or time in **joint professional development activities/retreat** mode. Cultivate spirit of willingness to develop new capacities that support interdisciplinary collaboration.

Please check AGREE or DISAGREE with the idea of more Year 1 planning and development of this nature.

- Budget resources for **project manager** to support the team in providing day-to-day administrative attention and sustaining a constant rhythm for the project.



Project Planning
Georgia State

- **External evaluation**

- Yes. Choose your evaluator wisely (took us 3 tries). Work hard to clarify early on what dimensions of the work are **education research** and what dimensions are **evaluation**.

Please check "LAUGH" if you too have experienced any challenges with clarifying this distinction and/or raise your hand to contribute a comment.

- **Too ambitious in Year 1**

- Us too! **Bite off LESS than you THINK you can chew in Year 1**. On a multi-year project, take time in Year 1 to lay a clear, mutually shared foundation for the work among team members, partners, and other stakeholders. IRB held our funding hostage though we did not need an IRB in Year 1.

Curriculum

U. Colorado

- **Plan highly interactive activities for young students (K-5).** We always planned for bilingual hands-on activities, but in Year 2 we increased the interactivity plus emphasized inquiry which added to the effectiveness of the activities.

- **Have focused themes.** In Year 1, we focused on climate change, which for young children was probably premature. In Year 2, we focused on four themes – air, water, soils and energy – which are key to understanding climate change, which us focus our activities more effectively.

- **Introduce all activities to facilitators before sessions during PD trainings.** In Year 1, we didn't allow enough time for training facilitators in all activities.

- **Provide an easy to follow format for activity guides for facilitators.** We refined the format for presenting activities to facilitators so that the graphic design and layout were clear and easy to follow. We also finessed our Facilitators Manual.

Facilitating Activities

U. Colorado

- **Carry through on educational objectives.** We found it important to have a clear theme for each session (e.g., evaporation) and reinforce the theme throughout a session.
- **Prepare plenty of materials so that each student can do the hands-on.** At first, we didn't prepare quite enough sets of activities. By year 2 we made sure that we had one kit of materials for each 2 kids.
- **Emphasize inquiry.** We had to constantly reinforce the spirit of inquiry in our activities! It is always easy to lecture to students.
- **Provide activities to facilitators well in advance of a session so that they can be fully familiar with them.** In our first year, when we were developing activities while delivering the program, we didn't allow enough time.

Curriculum & Facilitating Activities

Georgia State

- **Have focused themes.**
- Have **cross-cutting driving questions and big ideas** that are re-enforced by several of the lab activities. (e.g. How have human activities affected the atmosphere? OR How do changes to the atmosphere impact life?)

Please check AGREE or DISAGREE to indicate your response to the idea above and/or raise your hand to contribute a comment.

- **Plan highly interactive activities and good training for faciliators**
- A barrier to including hands-on activities that were recommended by educational partners for the renovated labs was that the graduate student teaching assistants (GTA's) serving as lab instructors do not generally have adequate background in climate change nor in the pedagogy of leading inquiry with students.

- Rather than establish a custom training for the GTA's, the Geosciences department opted to address this issue by making the labs **computer-based and student-directed, thus requiring minimal TA intervention.** The GTA's teach themselves by reviewing the lab materials on-line in advance.

Key for Success
Parent Involvement
U. Colorado

- **Take home activities are hard.** We sent kits of take-home activities but had to experiment with an effective method of making sure they got home and were used. These were very well received.

- **Parent involvement is very important.** We always planned for parent involvement and learned how really important it is. We developed effective strategies and collaborations with valuable stakeholders in the community (BHP)

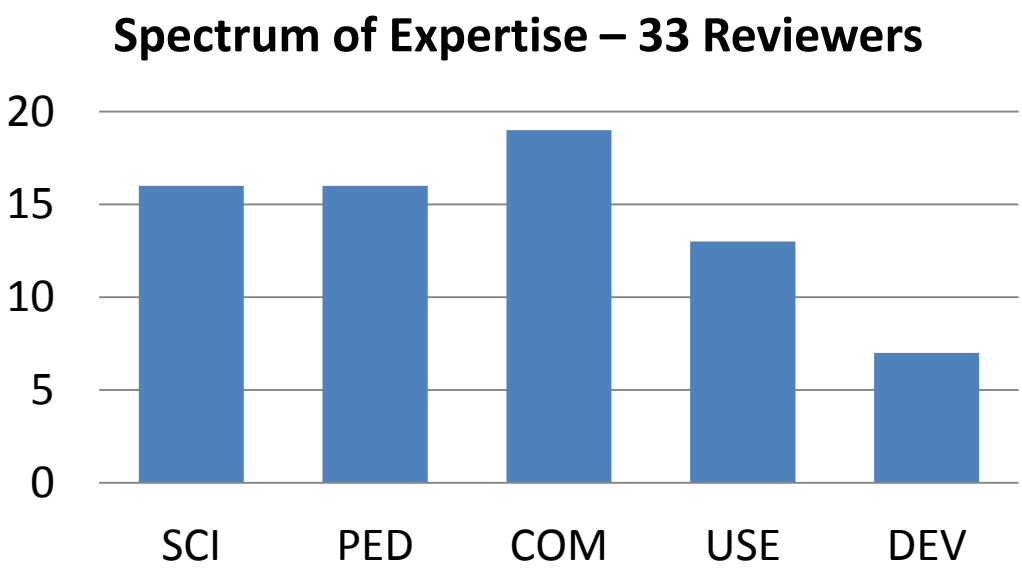
- **Family events are important.** We planned family events so parents could understand the program and feel part of it. This really helped in gaining consistent attendance of students. Numbers of parents increased during each Family night!

Key for Success
Broader Community Involvement
Georgia State

For purposes of this review, the primary expertise you bring is…
SCI: Climate Science
PED: Pedagogy of Climate Science
COM: Communication of Climate Science
USE: Use of Assessment Tools
DEV: Development of Assessment Tools

- Each of the 33 reviewers could choose up to **three** types of expertise.
- NICE Team recommended key reviewers in USE and DEV categories.

Spectrum of CICC Reviewer Expertise



Communication

U. Colorado

- **Get regular feedback from facilitators.** On year 2, we regularly surveyed our facilitators to get constant feedback, which helped us make changes throughout the project.
- **Develop clear and standard methods for communication.** It took us a few months from the beginning of the project to define routine communications.

Communication

Georgia State

- **Get regular feedback from facilitators.**
- Concur! GTA feedback on the labs was invaluable and was solicited by a variety of evaluative and collaborative means. Also we found independent observations of the labs to be an important source of formative assessment.
- **Develop clear and standard methods for communication.**
- So easy to say, so challenging to do well among over-busy, multiply distracted faculty members who despise attending meetings, particularly during the summer.

Stakeholders

U. Colorado

- Stakeholders proved to be great support. It was greatly beneficial to the program, and empowerment of families.
- We worked with 22 stakeholders and worked closely with 11.
- Our Media stakeholder (Univision Colorado) was instrumental in building community with Latino parents and our program. (https://www.facebook.com/photo.php?v=365507003501270&set=vb.167937486591557&type=3&theater)
- Our End of Year Celebrations (Year 1 and Year 2) were held at CU Boulder campus (CU Atlas), and CU Museum of Natural History. This strategy proved to be a very powerful way to bring Latino families to campus and have them meet Latino guest speakers and faculty form the University.

Stakeholders

Georgia State

- Used a **campus visit by a distinguished collaborator** as an opportunity to brief administrators (e.g. **Provost and Deans**) as well as campus journalists regarding our project. Free video taping and archiving of the guest presentation was provided by the College of Arts & Sciences.

- Worked through the **Dean of Community Partnerships** in the College of Education to build on pre-established trust with external collaborators.

- Found it valuable to have **Geosciences department chair** as funded Co-I for overcoming obstacles, and later to have chair as successor PI because it brought MUCH more administrative and logistical support to the project (naturally at the disposal of a department chairman).

- Probably should also have found a way to fund the **Physics and Astronomy chair** (where the grant was initially based). Chairs are understandably concerned about grant funding benefitting faculty and graduate students **in their department** rather than having the resources leave to fund personnel in other departments, Colleges, or institutions (even if the work is more suitably accomplished there).

Special Moments







Contact Information

U. Colorado

Marina La Grave, PI

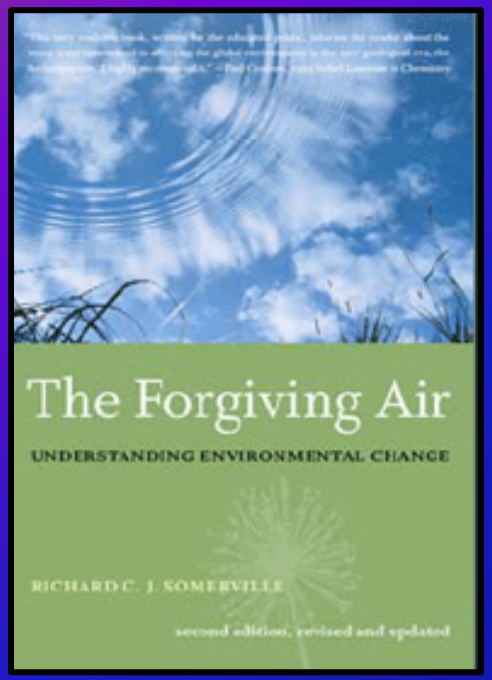
mlagrave@clace.us

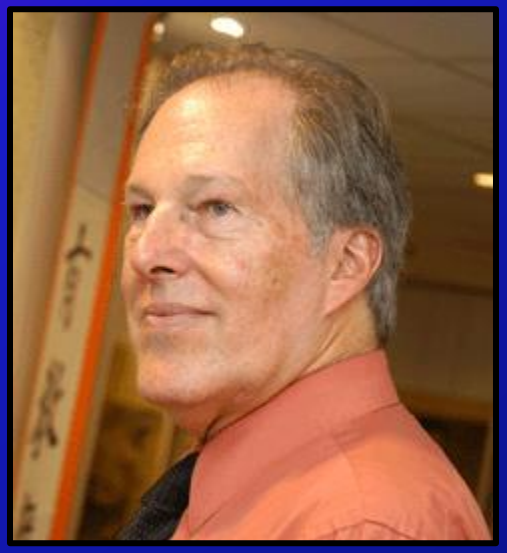
Office: 303-499-5881

Website: *www. CLACE.us*

Thank you NICE team!

Dr. Richard Somerville – Science Consultant





Public Science Talk on Campus

23 January 2010 attended by > 200 students & faculty

We collected 5x7 cards from participants with responses to questions on the final slide of the presentation.

Data suggested that an accessible straight science talk by a credible scientist that explicitly expresses up front that it is NOT about politics or ideology can stimulate college students to re-examine what they've heard at home, on talk-radio shows (or even in the classroom) about climate change.

Cultural Change Takes Time

Georgia State

- Contact with students via qualitative research methods (e.g. student group interviews) was invaluable in developing the CICC.
- Such research is not uniformly respected among physical science colleagues and needs careful representation and explanation.
- The Geosciences department continues to wrestle with whether and how to make use of the Concept Inventory in an ongoing way to help assess instructional strategies and student learning in GEOG 1112.
- Currently there is no validated method in place for doing this but it takes sustained time and resources to make this commitment to educational excellence.

How can positive change avoid feeling like this?

Interested to try the CICC? Please contact cmorrow@agci.org

Interested in the labs? Please contact jdiem@gsu.edu

Other inquiries: Please contact wcelliott@gsu.edu